Under the skin: the bird collections of the Natural History Museum

by Alan G. Knox & Michael Walters

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The bird collections of the Natural History Museum (NHM), formerly known as the British Museum (Natural History) or BMNH, have been housed at Tring, in Hertfordshire since the early 1970s. Increasing pressure on space at South Kensington in London caused the move out of town, to a site adjacent to the public galleries of the Zoological Museum at Tring. The latter had been bequeathed to the BMNH by Walter, Lord Rothschild, in 1937. The circumstances of the bequest, and the earlier sale of most of Rothschild's bird skins to the American Museum of Natural History, are described by Murphy (no date) and Rothschild (1983). The Tring public galleries are still maintained as a splendid example of a Victorian natural history museum, undoubtedly the finest in the country, devoted entirely to the spectacle of diversity. Some of the best taxidermy of the period is on display.

This paper describes briefly the museum at Tring, outlines the scope and nature of the NHM bird collections and presents information about the specimens and their documentation. Attention is drawn to some of the possible sources of inaccuracy associated with museum data. Some of this information is relevant to any large collection. The curatorial comments may be of interest to staff with responsibilities for bird collections in other museums.

The NHM holds over one million bird skins, one million eggs, 13,000 anatomical specimens and 8000 skeletons, making it one of the 2 largest bird collections in the world. It is particularly rich in historic material and types.

THE TRING BUILDINGS AND FACILITIES

The Tring site consists of 2 main buildings linked together. The older part contains the Rothschild public galleries, with offices, stores and part of the library behind and below. On the other side of the car-park is the purpose-built, 4-storey, air-conditioned block which houses most of the bird collections. Between these lies a single-storey building with security/reception, offices, packing room, walk-in freezer, laboratory, staff room and a connecting corridor to join the main buildings together. Behind this block sits another large walk-in freezer and the separate dermestarium with a chemical store attached. The dermestarium consists of 2 rooms: an office/preparation area and the environmentally-controlled beetle colony where *Dermestes* beetles are used to strip carcasses.

For further information on the Museum at Tring, see Clancey (1984).

Libraries

The NHM has the finest natural history library in the world. Most of the holdings are at the main Museum site at South Kensington, in

London, but the bird library is at Tring. It is probably the best bird library in the world concentrating on faunistics and works on taxonomic groups. Historically, the library comprised 2 main parts, the Rothschild Library (part of the bequest) and the library of the NHM bird section. The distinction is now less clear as the holdings have become integrated. At his death Rothschild's library was incomparably complete in the older literature and books on travel, exploration and big game hunting, and is housed in an exquisite 3-level balconied room. This area is not normally open to visitors. The remainder of the library at Tring is currently dispersed in several parts of the buildings. It is not a lending library, but is available to visitors by appointment and enquiries by post. Charges are made for photocopies.

Storage units: the Tring cabinets

Most of the bird skins, as well as the eggs, nests and skeletons are stored in specially constructed cabinets.

These cabinets consist of two 2-door units one on top of the other. Each unit has a removable central divider and may thus take either full- or half-width plastic drawers sliding on plastic runners. The carcasses of the cabinets are constructed from chip-board, which works well with half-width drawers, but has bowed slightly on some cases allowing some full-width drawers to drop. This is easily corrected with small wedges between the cases.

The doors are metal skinned, with refrigerator-type magnetic seals. The plastic skin on the door seals has become tacky on many units, and the adhesive bonding the metal strip to the carcasses has failed in places. Each door has a label holder on the outside and a recessed pocket for insecticide within. The door pockets in the bird skin cabinets contain insecticide, which is changed twice yearly. Until recently ceramic tiles impregnated with DDVP (Dichlorvos) were used, but these have been replaced with commercial Secto units in plastic cases. Severe corrosion is usual around the pockets, and ink from fibre-tipped pens used to label the drawers smudges and becomes illegible near the pockets. Pesticide levels within the cases are said to conform with recommended levels, but there is a strong odour on opening the doors and some users have experienced persistent headaches. Visitors to the collection are recommended to open the cases and allow them to ventilate before working with the specimens. The continued use of DDVP is being reviewed.

Within the half-width drawers many of the specimens are held in heavy, plastic-laminated cardboard trays in 5 modular sizes from 2 to each drawer down to 32.

The skins of many species have been divided into subspecies, and within each subspecies into separate sexes, age classes or by geographic origin as appropriate. The labels of the birds in each group are marked with numbered and coloured gummed paper spots and, for small birds, the groups are put in separate trays. This system has been found to aid research and curation, and helps users to return skins to the correct trays. Trays containing groups of interest may easily be carried to side benches for study.

The use of plastic drawers and laminated trays help to reduce abrasion on the skins and minimize the soiling of feathers which may occur in drawers constructed from less sympathetic materials.

THE BIRD COLLECTIONS

Spirit and skeleton collections

The ground floor of the main (new) building contains the spirit and skeleton specimens. The spirit collection is held in 70% industrial methylated spirit in the usual variety of bottles and jars on metal racking. Glass-topped bottles and jars with ground-glass stoppers are preferred, the most recent ones having been purchased from eastern Europe. Plastic-topped containers are being replaced whenever possible. Most of the larger specimens are contained in plastic buckets with lids, but the

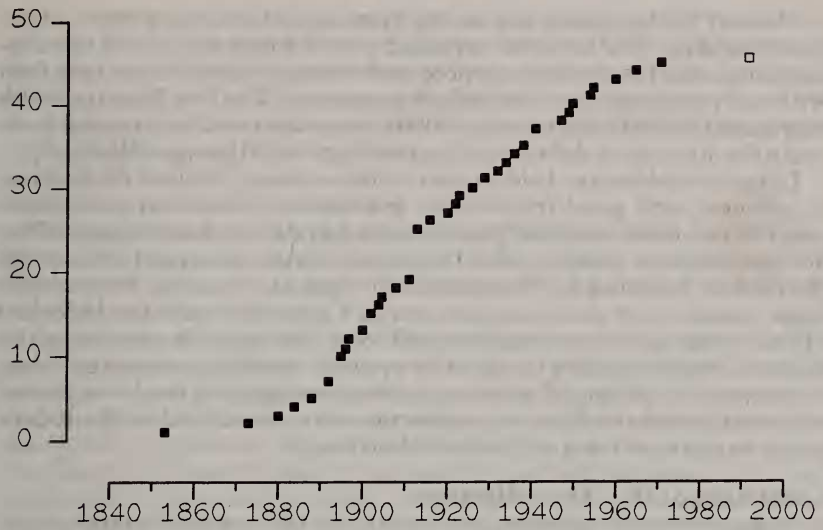

Figure 1. Growth of the Natural History Museum collections. Horizontal axis: year. Vertical axis: number of completed *Aves registers* (including sets of Special Collections *Registers*). The open symbol indicates a volume half-completed in 1992. (The use of the *Registers* in this way gives only an approximation of the growth of the collections.)

buckets occasionally split. The collection is arranged in systematic order following Peters (1931–87), the main exception being a metal cabinet housing extinct birds and historic or otherwise important specimens, including 2 birds collected on Cook's last voyage, one of which is still in its original bottle.

All but the largest skeletons are held in glass-topped boxes with labels clearly visible so that the contents may be checked without the need to open them. Several cabinets are reserved for important material, separate from the main systematic series.

The holdings of the anatomical and skeleton collections have recently been summarised by Blandamer & Burton (1979), Wood & Jenkinson (1984), Wood & Schnell (1986) and Wood *et al.* (1982a, 1982b). There are no skin-skeletons or long series of skeletons of individual species, or special tissue collections for biochemical research.

The skin collection

The large skin collection contains representatives of almost every species and subspecies listed by Peters (1931–87). In terms of numbers of individuals, geographic coverage is best for the Palaearctic, Africa, India and North America, and poorest for South America.

The collection dates mainly from the late 19th and early 20th centuries, and relatively little material has been acquired in the last 40 years (Fig. 1). Only 7 new skins were registered in 1986, and fewer than 50 per year is now usual.

Most of the bird skins are on the first, second and third floors of the main building. The birds are arranged in systematic order with the non-passerines starting on the top floor and working down to the first floor with the 'near-passerines' and all the passerines. The first floor also holds segregated series of the types (*c.* 8000), the extinct and endangered birds and a few historic or delicate collections (e.g. the Montagu collection).

Large bird skins are held in part of the adjacent Rothschild building in cabinets with good frameworks and drawers, but with poor fronts constructed from modified plastic roller-blinds which often jam. They are also neither insect- nor dust-proof which is regrettable as the Rothschild building is environmentally less satisfactory. Rothschild's large collection of mounted cassowaries *Casuarius* haunt the basement of this building in even poorer conditions, but 'poor' is relative in this context. Most museums would envy even the worst store-room at Tring.

A separate building (the Annex) in the same street is used as a general store and houses the Museum's collection of mounted birds without data, many on open shelving with roller-blind fronts.

Condition of the skin collection

Being a very old collection, with relatively little recent material, many of the skins are not in the best of condition. Amongst the large birds in particular, damage from grease is common. The smaller birds suffer more often from detached legs, wings and heads, and this is worst in frequently-used groups such as the *Phylloscopus* warblers. Detached labels can occur anywhere in the collection, often the result of grease damage and/or embrittlement of the paper or poor handling or both. These problems will get worse rather than better as the collection grows still older and is used more, highlighting the conflict between use and conservation. Indeed, the oldest and most historically important specimens are amongst those at greatest risk. The need for adequate conservation resources is a problem in most bird skin collections throughout the world and, until it is addressed properly, irreplaceable specimens will continue to be threatened.

Documentation

There is no card- or other index to the whole collection, indeed only the extinct and endangered birds have been entered onto computer (Knox & Walters, MS). Apart from the information on the labels, field-notes that may have been lodged in the library and anything that may have been published about individual specimens, the only documentation to the collection is the *Registers* or the old *Catalogues* (see below). The monumental, 27 volume, *Catalogue of Birds in the British Museum*, published between 1874 and 1898 (Sharpe and others 1874–98), contains some details of the specimens in the collections at the time each group was revised. This work frequently reveals information on extant specimens that is not on the labels, and indicates where other specimens have since disappeared to or have been reidentified.

THE INFORMATION ASSOCIATED WITH THE BIRD SKINS

The quality of data associated with specimens in many museums, particularly the older specimens, is extremely poor and often contradictory.

This problem has been discussed previously by e.g. Van Tyne (1952), Clench (1976), Conover & Hunt (1989) and Parkes (1989a,b). Recommendations for critical data have recently been made by Foster & Cannell (1990). In the following section, although we discuss the quality of the data with particular reference to the collections of the NHM, many points apply equally to any large collection.

Museum registration numbers

Many specimens, skins in particular—perhaps as many as 100,000—have never been registered. In other cases, specimens were dealt with in blocks—for instance, a large part of the great Shelley collection occupies only 7 lines in the register.

Attempts to check numbers on labels against the original register entries reveals many irregularities. Some numbers were written incorrectly on the labels (or even in the register): given time, most, but not all, of these may be traced. Duplicate numbers are sometimes encountered. Many arise from the Special Collections registers (see below), but for others it is clear that 2 or more specimens (usually, but not always, with the same data) were registered with the same number without this information being noted in the register. Details of the *Registers* and *Catalogues* of the collection are given below.

Locality data on labels

Tracing place-names is often a difficult task, particularly with older museum specimens. The handwriting on labels is frequently illegible or nearly so, and may be in a foreign language or a collector's shorthand. Local names which do not appear on maps or in gazetteers are regularly encountered. Much collecting took place before detailed maps of the relevant countries had been prepared, and at a time before place-names had ever been written down. It was not unknown for a collector to use several different spellings for the same place-name, or different names for the same place. Some common place-names can be found repeatedly within a single country and in some countries place-names change with the political climate. Chinese place-names have their own special problems, as do many from the Near East.

Two other significant practices serve to introduce uncertainty concerning many of the apparent localities of older specimens. The first relates to localities not noted at the time of collection, the second, to the widespread removal of original labels.

The importance of precise locality (or any other) information was not recognised by many early collectors; large numbers of specimens bear no data at all or, at best, a country or continent alone. Other collectors made up labels long after the specimens were obtained, with the attendant possibility of errors of memory or transcription. A few unscrupulous collectors or dealers fabricated data to enhance the monetary or scientific value of their specimens (e.g. see Nicholson & Ferguson-Lees 1962). The huge Meinertzhagen collection at the NHM has many skins bearing incorrect data, including a number taken from the then BMNH and subsequently relabelled (for the evidence see Clancey 1984, Cocker 1990: 274–5; also A.G.K. pers. obs.).

Specimens were frequently obtained in batches from collectors (often native) and shipped through dealers and transit ports and, at any stage of this process, erroneous data could become associated with the specimens, inadvertently or otherwise. Some dealers (and even museums) attached their own labels, often carrying generalised distribution data relating to the range of the species rather than the locality of the individual. The data were not even safe when the specimens reached the British Museum. For a while, localities and dates were routinely transferred to Museum labels, and all others removed (Sharpe 1906). Many errors arose in this way. The practice was not that of the British Museum alone, but was widespread among curators until the late 19th century. Where additional labels had been attached to specimens and the earlier ones retained, errors of transcription are frequently noted. Examples may be found in Knox & Walters (MS).

Particular care is required when dealing with specimens which are mounts or ex-mounts. For a long time during the 18th and early 19th centuries all important specimens were set up for display in the public galleries of the Museum. Such specimens usually had their labels removed and, with some, the data written on the base of the mount or printed on the accompanying gallery label. Few of the latter still exist and many of the old gallery specimens have since been unmounted and transferred to the general skin collection. Most specimens which were formerly mounted (or are still mounts) lack data; with others there are doubts concerning the veracity of data after repeated transcription. In a few cases it is clear that when gallery specimens became damaged, or better ones became available, birds were substituted without necessarily changing the data. Some were placed on mounts formerly occupied by conspecifics or quite different species. Since the late 1980s, the Museum has not unmounted birds for them to be placed in the general skin collection, as the former practice often led to the loss of information concerning the history of the specimens.

Date of collection, or date of death of specimens from captivity

Many of the comments made above regarding the reliability of locality data apply equally to the date, where the information may have been transcribed several times or added long after collection. At its worst, during the preparation of the *Catalogue of Extinct and Endangered Birds* (Knox & Walters, MS), three different dates (without comment) were found on separate labels attached to a single specimen.

The labels on many specimens, particularly from the Salvin-Godman and Sclater collections, bear dates usually consisting of the year, or the month and year only, written close to the thread holes at the left-hand end. In some cases it appears that these are the dates of collection and in others, that they are the dates when the specimens were received. Where the label bears only one date, it is not possible to tell which it is. Where 2 dates appear, they are sometimes the same but, more usually, the left-hand one is later.

The labels to some older bird skins also bear the dates when the specimens were sent to the 'stuffers', usually to be unmounted, cleaned or repaired. It is only too easy to mistake this for the date of collection,

particularly if the latter was not recorded. The stuffer's name (not always given) or a date several decades after the year of registration are the main warnings, but some stuffers' dates are disturbingly plausible as dates of collection. The NHM still holds several volumes of notebooks recording the movements of specimens to and from various stuffers, including Burton, Cullingford, Dodson, Gerrard, Gunn, Pickhardt, Rye and West, for the period 1871–1895.

Information on the original collector (if known), or the route by which the specimen reached the Museum

The names of the original collectors, dealers, private collectors and other intermediaries through whose hands and/or ownership the specimens passed before they came to the Museum have caused almost as many problems as the place-names. Alternative spellings, difficult handwriting, initials without full surnames and other missing or incomplete data pervade the collections and the registers.

For information on many collectors and donors, see Sharpe (1906), Warren & Harrison (1966–73) and Mearns & Mearns (1988).

Age and sex data

Although many or most specimens were probably examined internally at the time of collection, this is rarely noted on the label. A proportion of specimens will have been mis-sexed, for 2 main reasons. Firstly, for some, sex will have been determined on the basis of (incorrectly) presumed plumage or mensural differences, either on collection, or at any time subsequently. Secondly, mistakes may have been made in the internal sexing of specimens that were damaged or partly decayed, or with small sexual organs (particularly during the refractory period). Careful sexing (with notes and sketches of the gonads, and the name of the preparator) is particularly important with skeletal material, in which there is the additional danger of misidentification of species. Fig. 2 illustrates mis-sexing in some skeletal material.

For further discussion on the reliability of sex information on museum labels, see Clench (1976) and Parkes (1989a,b).

Duplicates

Occasional reference will be found on labels or in the literature to 'duplicates'. For a long time (since the late 1700s) it was the practice to select only the best specimens for the NHM's collections, and consign the others to the 'duplicates', in the basement. Very large numbers of birds were so designated. They were kept separately from the main series, and the labels were usually annotated 'duplicate', 'dupl.' or 'dup.'. These birds were often used for exchange or presentation. Storage space was always at a premium when the bird collections were held in London, either at Bloomsbury, or later at South Kensington. From the 1940s until the late 1960s, many drawers were so full that specimens without good data were removed and sent to Tring Zoological Museum, where the 'duplicates' were then housed. Similarly, poor specimens, or ones with incomplete data from newly received collections were dispatched regularly by van to Tring. Although the assignment of new duplicates has

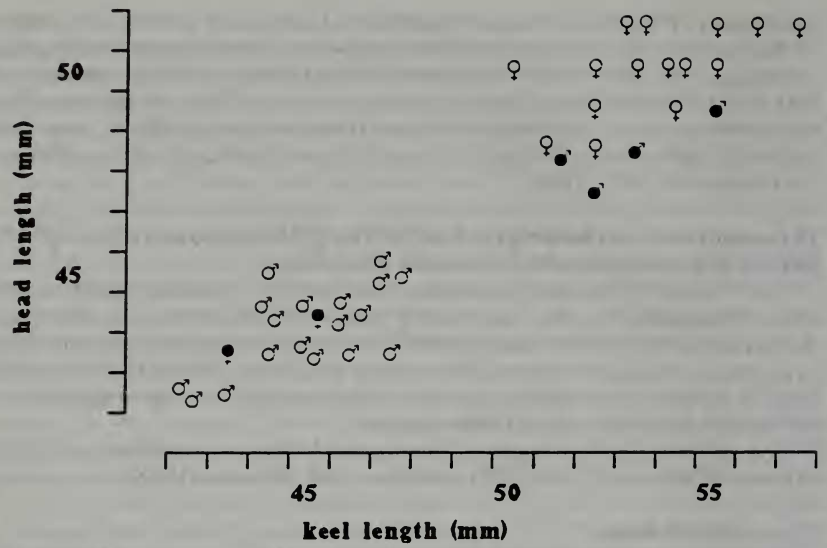

Figure 2. Skeletal measurements of British Sparrowhawks *Accipiter nisus* in the Natural History Museum, registered 1951–1988. Symbols denote sex as shown on the box labels. Filled symbols indicate specimens presumed to have been sexed incorrectly. Most species of birds show less sexual dimorphism in size than the Sparrowhawk and mis-sexing would be more difficult to test in their case.

ceased, it has not yet been possible to reincorporate all the previously separated material, and drawers or trays marked 'duplicates' may still be found in the collection.

Missing specimens

Specimens known or thought to have been in the collections are sometimes unable to be located. Indeed, a significant number of specimens could not be found during a recent NHM cataloguing project (Knox & Walters, MS). Specimens which are listed in the registers, in the *Catalogue of Birds* or elsewhere can appear to go missing for a variety of reasons. Some will have been re-identified and moved to a different part of the collection; some will have been exchanged or given away; a few will even have been so badly damaged by insects or other causes that they have been subsequently destroyed. In all these cases, it would have been usual to annotate the register accordingly, but this sometimes was not done. Furthermore, specimens are not infrequently put back in the wrong place in the collection by visitors (and occasionally by staff): with a collection as large as that of the NHM, it becomes difficult to relocate specimens misplaced in this way. Some genuinely will have been lost, and a few will possibly have been stolen (see e.g. Clancey 1984). A quantity of eggs from the Jourdain collection were never actually received, although the card-index might suggest otherwise. Likewise, some other specimens that the Museum is said to possess, never arrived, and a small number of entries

may be clerical errors. Many older labels were made of flimsy paper or card that has become brittle. When the specimens became separated from their labels (as many of them did), they became unrecognizable and, effectively, lost.

The Old Collection

As far as we can ascertain, the term 'Old Collection' has been used in a variety of contexts. It seems to have been applied to the collection which was housed in the public rooms of Montagu House in the early 1800s, at least part of which was then moved to the galleries of the new British Museum (completed on the same site in 1845). Some specimens remained on show until at least the 1870s, but others were removed from time to time and placed in the study collections. 'Old Coll.' appears without definition in the *Catalogue of Birds*, apparently referring to various old, or not so old, usually unregistered, specimens. The term has also been used, seemingly without much discrimination, at various other stages.

Type specimens

Many labels bear the inscription 'type'. Most of these do not refer to name-bearing types, but to specimens that are 'typical' in some way. Holotypes and syntypes identified or selected by Warren & Harrison (1966–73) and others are segregated into separate cabinets and carry red labels for easy identification.

Additional comments

The collection mainly being old, the labels rarely carry information about bare-part coloration, stomach contents and so forth.

THE EGG COLLECTION

Like the skeletons, the egg collection is stored in clearly labelled glass-topped boxes. Within each box the eggs rest in individual depressions in cotton wool, restrained from movement which could damage them during curation or while being studied. The boxes also provide additional protection against atmospheric particulates. For security, the cabinets are locked and unlabelled.

Approximate size of the collection

The egg collection is believed to be the largest in the world. The eggs have never been counted and, because eggs are usually kept and catalogued in sets or clutches of varying size, the number of items catalogued is not an indication of the total size of the collection. (A set is regarded as one or more eggs of the same species collected or received together, not necessarily a clutch.) About half the cabinets in the systematic series have been revised and, by random counts of specimens in the remainder, an estimate of *c.* 1,000,000 eggs has been made. To arrive at an average number of clutches it might be necessary to divide this total by 3–4.

The age of the specimens

Only a few of the Museum's eggs are more than 150 years old. The earliest so far found is of a Northern Gannet *Morus bassanus* from the Bass Rock, in Scotland, collected in 1807. It is probable that some undated eggs are older than this. A number are labelled 'Old Collection', and among them are probably the ones referred to by Lankester and by Oates on pp. v and vii of Oates (1901). These were from a very early collection displayed in the public galleries. Many of the eggs listed in the main text of Oates (1901–12) as being from the Old Collection were more recent, having been acquired from nineteenth century dealers such as Fraser, Warwick and Parzudaki, though they share with the old eggs the lack of data and dates. There are also a number of eggs listed as 'Montagu collection' or 'ex Montagu Museum'. These were probably received at the same time as the Montagu collection of bird skins (1816) and some may be of eighteenth century vintage.

Most of the Museum collection (about 90–95%) dates from the latter half of the nineteenth century and early part of the twentieth. Apart from the Pitman and Benson east African collections, and more recent confiscations of eggs taken illegally in this country, there is little material from later than about 1940.

Systematic coverage

The eggs are stored and curated in systematic order, following Peters (1931–87). There are specimens from all orders and nearly all families, apart from a few which are monotypic. The nests and eggs of about one third to one quarter of the world's species may still be undiscovered or undescribed; in addition, a number of species from remote areas are not represented. Nevertheless, this is probably the most comprehensive collection in the world.

There are particularly good series of Ratites (including the Tinamidae), Cuculidae, and especially *Uria aalge*.

Special collections

In addition to the systematic series, some collections are kept separately:

Eggs of varieties of domestic poultry.
Six eggs of *Pinguinus impennis*.
Stuart Baker's collection of *Cuculus canorus*. It has not been practicable to incorporate in the main collection the eggs in all the boxes of this species.
Chance Collection, still in its own cabinets.

Geographic coverage

Most collecting occurred when the colonial powers of the northern hemisphere were in their heyday. This is reflected in museum collections of that period, and those of the NHM are particularly rich in African and Indian material. Local and national museums may have more complete local collections but few, if any, have the general coverage of the NHM. However, where we have indicated that the Museum's coverage is

weakest, it should not always be assumed that better collections exist elsewhere. Degree of coverage is given below by regions.

Western Palaearctic. Very good.

Eastern Palaearctic. Not good. The best represented area is Japan from whence the collector Owston sent a considerable amount of material to Rothschild. There are also collections by Katsumata from Hainan and Tancré from central Asia (particularly the Altai and round Issyk Kul Lake). All of these were received with the Rothschild bequest. The Museum also holds the collections of La Touche, Rickett, Styan and Swinhoe; these are mainly from south China.

Middle East. Patchy and poor. Some good collections from southern Iraq and the northern end of the Persian Gulf, but otherwise comparatively little.

Africa north of the Sahara. Poor. There are collections made by expeditions to Morocco under Salvin, Tristram and others in the 1850s and by Rothschild and Hartert in the early years of the 20th century. Some collectors such as Aharoni collected in the Sahara (and also in the deserts of the Middle East) but these collections are small.

Afrotropical Africa. Good, but patchy. Parts of east Africa were well worked by collectors such as Benson and Pitman, but there is very little from west Africa. Angola and Gabon are represented solely by material from Ansorge, a botanist who collected anything he found, including quite a number of birds with their nests and eggs. He apparently knew little about birds and the identifications were made later; there is thus a small element of doubt with some. From South Africa there are the Layard collections (usually with no data) of the nineteenth century, and one or two small collections such as that of Bernard Jupp.

Burma and the Indian sub-continent. Excellent. Mostly the work of British Army officers and civil servants, these are probably the best in the world for this area; an incomparably rich collection.

Southeast Asia. Almost nothing except the E.G. Herbert and Sir Walter Williamson collections made near Bangkok, Thailand. Both contain good series of local species.

Indonesia. Almost nothing, this area formerly being under Dutch influence. There are collections by Whitehead and Sir Hugh Low, both from British Borneo, and the Steere Expedition specimens from the Philippines. This area is the most poorly represented in the whole Museum collection.

Melanesia and the Papuan regions. Not good. Rothschild's collectors moved through this area and collected extensively, but eggs were nowhere taken in quantity.

Australia and New Zealand. Not good. A number of eggs are of historic interest, particularly those from John Gould and Sir Walter Buller. A list of Australian eggs in the collection was drawn up in the 1960s prior to the Harold Hall Expeditions. This is no longer complete, due to more recent acquisitions.

Pacific Ocean. Poor overall, but there are long series of some species from particular islands, such as Norfolk, Lord Howe and the Galapagos. Many islands are not represented at all, and most are represented only poorly.

North America. Rather poor, mostly dating from the 19th century.

Central America. Very poor. Very little collecting seems to have been done here by the British, apart from Godman and Salvin during the last century.

South America. Very poor on the whole but, for a high proportion, the eggs of South American species are still unknown. There are good collections from Trinidad and the Falklands, and long series from places like Los Yngleses (a British-owned estate near Buenos Aires belonging to the Gibson family) but the general coverage is not good. Other important collections include those by Berkeley James from Chile, and Venturi from Patagonia.

In summary, the collection possesses probably the best assemblage of eggs of the Indo-Burmese area, and possibly the best general collection for Africa. It is weak in specimens from North and South America and Southeast Asia.

Some collections of particular interest

Stuart Baker collection. The largest collection of Indian eggs and, although a few specimens are suspect, some species are not known to be represented in any other collection.

T.R. Bell collection. A fairly large Indian collection, which arrived in its original boxes with each egg individually wrapped in cotton wool. Bell worked for the Forestry Commission in India in the late 19th and early 20th centuries. His field diaries are in the Entomology Library of the NHM at South Kensington.

Edgar Chance collection. Completely card-indexed, this collection arrived in its own cabinets. As it was well housed and beautifully laid out, it has never been incorporated with the main collection. Chance wrote several books on the Cuckoo.

Philip Crowley collection. At the turn of the century, this was the largest egg collection in private hands. A proportion of it was acquired by the Museum about 1901–2, the rest was dispersed and may now be lost. So, too, are his original catalogues. Some species are still, after nearly a century, represented only by eggs from this generous bequest.

J. Davidson collection. This large Indian collection was received about 1925 and, although much of it has been incorporated, a great deal remains to be done. Davidson had sorted and catalogued part of it after his return from India. A considerable amount seems never to have been unpacked, and reached the Museum in the original boxes in which it travelled back from India. The eggs had not been sorted into clutches, or even species. They are identifiable only by species numbers written on them, the numbers referring to one of 2 lists of Indian birds. Like Bell, Davidson apparently worked for the Forestry Commission in India.

J.H. Gurney collection. Incorporated in 1955, this was formerly at Norwich Castle Museum. It consists only of birds of prey and owls, but includes some species not otherwise represented in the collection.

A.O. Hume collection. The first large collection of Indian eggs, received in the 19th century. Hume was one of the most significant early contributors to Indian ornithology, and published his own journal *Stray Feathers*.

F.C.R. Jourdain collection. This huge collection must be one of the most important for the Palaearctic.

H. Munt collection. Henry Munt specialised in white eggs, and in eggs from birds in captivity (he seems to have been in close communication with many breeders). His collection contains many rarities. The collection was registered in 1941.

J.D. Salmon collection. Formed in the early nineteenth century, and donated to the Linnean Society in the 1860s, before subsequently coming to the Museum.

H. Seebohm collection. The earliest large collection of Palaearctic eggs.

Rödern collection. Count von Rödern's collection was acquired by Rothschild towards the end of last century. It was apparently accompanied by 2 catalogues: one printed, and a manuscript written by Max Kuschel, the well-known German oologist. These were last seen at Tring in the 1950s, when Glegg mentioned them in a note in the *Ibis* (1951: 305–6). They subsequently disappeared. The collection is poorly documented but contains some interesting specimens, including series showing wide ranges of colouring within selected species.

Eggs of particular interest

An egg of the extinct Syrian Ostrich *Struthio camelus syriacus*, which passed in turn from Charles Doughty to Col. T.E.Lawrence (Lawrence of Arabia) and Col. Richard Meinertzhagen.

The only known egg of the extinct Kangaroo Island Emu *Dromaius baudinianus*.

A clutch of eggs of the Emperor Penguin *Aptenodytes forsteri* collected by Cherry-Garrard (Cherry-Garrard 1922).

Two putative eggs of the extinct Labrador Duck *Camptorhynchus labradorius*. There are no eggs of this species whose authenticity is above question (*contra* Greenway 1967: 174; see also correspondence at Tring).

Type specimens of *Anthus venturi* and several putative species of *Megapodius*.

The only eggs of the extinct rails *Cabalus modestus* and *Pareudiastes pacificus*.

An English egg of the Great Bustard *Otis tarda* from the Montagu Collection; the Great Bustard last bred in England about 1840.

H.L. Popham's clutch of the Curlew Sandpiper *Calidris ferruginea*; this was the first clutch ever found of this species, and is still the Museum's only clutch.

Six eggs of the Great Auk *Pinguinus impennis*. The Museum also holds a number of plaster casts and models of Great Auk eggs, often carefully painted in the colour and pattern of particular specimens in other collections. There is also a remarkable fake, an egg of a swan which was painted to resemble that of a Great Auk. It was part of the J. D. Salmon collection (see above) and had been substituted for a real Great Auk egg in that collection, sometime between Salmon's death and the acquisition of his collection by the NHM.

Eggs (and nests) of the extinct Laysan Millerbird *Acrocephalus familiaris*.

Five eggs collected by Audubon. All seem to have been acquired by H.B. Tristram, whose collection passed to Crowley. The Museum received many of Tristram's eggs with the latter's bequest. The Museum also has Tristram's complete catalogues. It is probable that other Audubon eggs await discovery.

There are a number of eggs of other extinct species, together with specimens collected by well-known ornithologists such as Ayres, S.F. Baird, D. G. Elliot, Heermann and Krider. Many of these are without data and had been set aside as 'duplicates', although they have now been retrieved.

Unincorporated collections

Neglect of the egg collection during the early and middle 1900s led to a considerable backlog of incorporation. There are a number of valuable acquisitions, estimated at 30–40,000 eggs, which are still partially or entirely unincorporated. Since these are not in a state in which they could be used by visitors, this represents a great loss to the collection.

Col. E.A. Butler collection. A very good collection, mainly from India, Ceylon and northeast Africa. Registered but still only partly incorporated. Butler was an army officer who collected eggs as a hobby and published a number of papers. His collection was received by the Museum as part of the Rothschild bequest.

Chance collection. See 'Some collections of particular interest'.

Davidson collection. See 'Some collections of particular interest'.

Jourdain collection. Several cupboards contain the residue of this vast collection, which formed part of the Hewitt bequest (the rest of which is now at the Delaware Museum). The eggs were very mixed-up when they arrived at the Museum, and considerable numbers still cannot be matched with the relevant data.

Letchworth Museum collection. A mixed assemblage, but including some quite rare eggs of North American waders. Only partly incorporated.

Capt. Pitman collection. The late Captain C.R.S. Pitman, probably the most important east African collector, presented his eggs in small numbers over a period of time. Much has been incorporated, but some still awaits study.

H.L. Popham collection. An important Siberian collection; still only partly incorporated.

Rödern collection. See 'Some collections of particular interest'. A portion of this collection awaits incorporation.

South Kensington. A batch of eggs received about 1981 seems to be part of an old collection formerly in the public gallery. It includes a number of very old specimens registered prior to 1880 and not listed in Seebohm's ms catalogue (see below).

Tait collection. Put together by a well-known English ornithological family resident for some years in Portugal, and presented to the Museum some time after the death of the last surviving member living there. The eggs are very dirty and, until recently, were unsorted. The data slips (in Portuguese) have also become separated from the relevant clutches. This collection contained the only known eggs of the Guillemot *Uria aalge* from Portugal, and these have been incorporated.

William Borrer Tracy collection. British eggs of historic interest presented by Rear Admiral H.G.H. Tracy in 1979.

F.E.W. Venning collection. Venning worked mainly in Iraq, Pakistan and Burma, where he was one of the most important collectors. He was exceptionally meticulous. The collection was accompanied by detailed notebooks containing a wealth of data on each clutch, mainly relating to nest site and nest construction, incubation and so forth. It has only been partly incorporated, and most of Venning's valuable data seems never to have been published.

S. Venturi collection. A South American collection of great importance, written up by Hartert & Venturi (1909). Part of the Rothschild material. Most has been incorporated.

Waller collection. A large collection of general interest, received in the 1970s.

Whitehead collection. John Whitehead was a famous explorer and collector who visited and wrote about Mt Kinabalu, Borneo. He subsequently died while on an expedition to Hainan. His collection of European eggs was acquired by Rothschild and bequeathed to the NHM. Mostly incorporated, but a small part remains.

P.F. Wickham collection. A collection of Burmese eggs presented by Exeter Museum in the 1980s in exchange for some mounted skins.

The history and status of curation

The egg collection was last completely revised and catalogued in the 1890s, by Henry Seebohm. It was set out and labelled at this time by Miss Emily Mary Sharpe (Dr Bowdler Sharpe's daughter), since when many boxes remain unaltered. Seebohm prepared a manuscript catalogue (still held in the Egg Section) of all the specimens in the study collection. This did not include eggs in the public galleries and, in recent years, some of these have been retrieved and incorporated. The galleries were raided from time to time by members of the public, and many eggs are now lost.

Between 1901 and 1912 the 5 volumes of Oates's *Catalogue of the collection of birds' eggs in the British Museum (Natural History)* were published by the Museum (Oates 1901–12). They were based on Seebohm's manuscript, but included many additional specimens. The introduction to volume 1 contains further details of the history of the collection.

Curation of the collection over the subsequent 60 years seems to have been fitful, though a card-indexing system was started quite early on. Its coverage was no more than perfunctory and work seems to have ceased on it after a short time. Only a small number of the original cards have been found, mostly relating to birds of prey. They are beautifully written and demonstrate detailed and meticulous research. The writing appears to be that of the Rev. F.C.R. Jourdain.

Although Walter Rothschild's bird skins from Tring were sold to the American Museum of Natural History in 1932, he retained his sizeable egg collection. The latter passed to the Natural History Museum on his death in 1937, the largest acquisition ever received. During the 1940s, W.E. Glegg sorted and registered parts of it, a task continued by Mrs F.E. Warr in the 1950s. Rothschild's material was an assemblage of separate collections brought together by him, mainly by purchase.

Mrs Warr was also responsible for initiating the accessions index for the Museum's egg collection. For a time, Rachel Warren worked on parts of the Davidson material, but most of her cards have now been replaced. Some donors of small collections wrote their data directly on to Museum cards and these are preserved in the index. Envelopes, the same size as the

cards and similarly printed, are used to hold original labels, letters or similar material relating to the relevant eggs.

In 1960 an attempt was started by C.J.O. Harrison and S. Parker to recatalogue and completely card-index the collection. From this date onwards all eggs received and incorporated—a considerable number—were card-indexed, and given a new style of label. Prior to the NHM's Harold Hall Expeditions (Hall 1974), all the Australian material was revised and card-indexed, mainly by Mr Parker, although more has since been added.

From 1970 onwards, MW has worked on incorporation and the systematic revision of the entire collection. Most of the cards from this period have been typed, whereas the bulk (though not all) of the previous ones are handwritten. The non-passerines and sub-oscine passerines have now been revised and card-indexed. Data extracted from the Seebohm and Oates catalogues have been added to the cards, and entries have been made (in red ink) for eggs no longer in the collection.

During the 1970s there was a series of systematic thefts by a visitor, Mervyn Shorthouse, who had been using the collection regularly. Between 1975 and 1979, an estimated 30,000 eggs were stolen before he was apprehended (and subsequently convicted). About 10,000 eggs were recovered, but the usefulness of many is limited, and the integrity of large parts of the egg collection has been jeopardised. As well as removing eggs, Shorthouse often substituted specimens from elsewhere in the collection to fill gaps and, in some instances, deleted and replaced registration numbers to conceal his activities. Many of the recovered eggs had data, set-marks and registration numbers removed from them, making it difficult to match the eggs with their data. The collection has since been carefully revised through to the Alaudidae. Until the revision is complete (which will take some considerable time), the remaining passerine eggs can only be used with great care.

The nest collection

The nest collection contains only about 2000 specimens, of which probably fewer than 200 are non-passerines. The coverage is poor in every way, although no detailed investigation has been carried out. It is less of a collection than an accumulation of miscellaneous material which happened to be deposited with the Museum over the years. Thus, there are quite long series of some Himalayan species (from H. Stevens), while many common British species are either unrepresented or represented by only one or two examples.

The nests have only been roughly sorted into families, and no catalogue has ever been made. The nests are stored in Tring cabinets, either loose in the plastic trays or in glass-topped boxes.

THE REGISTERS AND CATALOGUES OF THE BIRD COLLECTIONS

The registers and the catalogues of the Museum collections fulfil quite separate purposes. The registers contain details of specimens, entered as they are acquired (or curated), and usually arranged in blocks of specimens received together. The catalogues contain details of specimens arranged in a systematic, or similar, order.

The Old Catalogue

The earliest extant list of the collection is a thick catalogue volume with pages watermarked '1813', compiled by Dr W.E. Leach. Each page was numbered and used for a different species, with the specimens listed in columns down the right-hand side. Some specimens were indicated by letters of the alphabet. A synonymy with references was given for each species. This volume is referred to as the *Old Catalogue*, and appears to have been in use from 1813 (or shortly afterwards) until about the commencement of the *Vellum Catalogues*. A note, probably by J.E. Gray or J.G. Children, referring to this Catalogue is to be found tipped in at the beginning of *Vellum Catalogue* volume 5. It explains some of the entries and indicates species that were wanting in 1824.

The Vellum Catalogues

Most of the entries from the *Old Catalogue* also appear in the more comprehensive *Vellum Catalogues*, which were mainly compiled by G.R. Gray. The paper in these volumes is watermarked 1832, 1833 and 1834. The *Vellum Catalogues* were not apparently maintained beyond 1837. Forty of the 44 volumes in the series are divided into 15 sets covering the major groups of birds. Within each set, the right hand pages are numbered consecutively, one for each species of bird, for which a partial synonymy, without references, was also given. Individual specimens were identified by different letters of the alphabet. The registration number 12.177b is therefore *Vellum Catalogue*, volume 12, species (page) no. 177, specimen 2. The other 4 volumes (numbered 1–4) were used for British birds, and do not strictly belong with the remainder of the series. In the time of G.R. Gray, volumes 5–44 of the *Vellum Catalogues* were known as the *General Catalogue*, and the sets were identified with Roman numerals; reference to an entry took the form: xii 177b.

The General Registers

The main registers began in 1837 as a combined vertebrate series. These are referred to as the *General Registers*. Registration numbers originally comprised 4 groups of digits, the first 3 being the year, month and day of registration, and the last being the specimen number on that day, for example, 1842.5.17.16. Birds continued to be registered in the *General Registers* until 1853. A single Vellum register of birds was maintained by G.R. Gray for 1837–8. It mainly consists of the same bird entries as are found in the *General Registers* for that period, but also has some which are not found there.

The Aves Registers

In 1854 the separate *Aves (Bird) Registers* were started, although bird skeletons were usually included with the rest of the vertebrates for several decades to come. Numbers in the *Bird Registers* follow the same format as described for the *General Registers*, until the 1940s, when the use of 3 groups of digits was introduced: the year of registration, a number allocated to each collection, and the number of the individual specimen within that collection, e.g. 1945.64.202. This change took place in July 1943 for eggs, and January 1945 for other specimens. A few large

collections were identified differently: e.g. 1949.WHI.1.1-17450 for the Whistler collection; 1955.6.N.20.1-4931 for the Gurney collection from Norwich Castle Museum and 1965.M.1-19575 for the Meinertzhagen collection.

Separate registers were used for part or all of several very large collections: Hume (3 volumes, 1885–95); Salvin & Godman (5 volumes, 1885–1913); Tweeddale (1887–92); Seebohm, Hargitt (1 volume, 1896–7); Simons (1902); Styan, McConnell (1 volume, 1907–22); Witherby, Ticehurst (1 volume, 1934, 1941); Whistler (1949); Gurney, birds of prey (the original Norwich Castle Museum catalogue into which a NHM registration number prefix was placed before each catalogue number [1889] 1955); Meinertzhagen (1965); and Hewitt (1969). Some confusion was incurred by the use of separate registers, and duplicate numbers are often found.

During the present century, most of the bird entries for the period 1837–53 were copied out of the old *General Registers*, into a separate volume of the *Bird Register* which is now used at Tring.

There are currently 29 volumes in the main Aves series, with a 30th in progress, and 17 volumes of special collections. Most run to 300–400 pages, with about 50 lines per page. Up to the end of 1941, each *Aves Register* contains either one or two indexes to the donor and sellers of the collections listed therein. There is also a comprehensive index covering the period 1906–1920. A separate series of small, loose-leaf binders, listing donors/sellers (and their specimens) in alphabetical order, covers accessions from 1906 to the present. For the period prior to that, Sharpe (1906) gives an index, but it is not complete.

Aves accessions for 1837–93 have been listed chronologically (and in part duplicated), one line to each collection, in a manuscript volume entitled '*Zoological Accession; Aves; 1837–1893*'. This provides an additional means of tracing specimens without the need to scan the full registers.

The Skeleton Vellum Catalogues

Separate *Skeleton Vellum Catalogues* (18 volumes), similar in layout to the *Vellum Catalogues*, were maintained from about 1844 (watermarked on the paper of the first 15 volumes; the last 3 are apparently later) through to the 1880s. Species numbers ran consecutively through the whole set, so volume numbers are not needed to locate entries, which take the form 944a. Most specimens also have *General Register* numbers. The catalogues appear to have been compiled initially between 1844 and 1846, probably for the bird part of Gray (1847). Some original entries do not bear *General Register* numbers, and some skeletal material remained unregistered until the 1950s, when all previously unregistered bones were registered. The old numbers are still found on many of the bones.

Card indexes

Separate card-indexes exist for the skeleton and spirit collections, and were apparently maintained until the 1930s. The former runs to 9 drawers of 5 × 3 inch cards. The spirit index comprises 6 drawers, with a seventh containing miscellaneous entries. Both indexes bear cross-references to

R.B. Sharpe's *Hand-list* (Sharpe 1899–1909), and were started sometime after publication of that work.

The Egg Register

The register for eggs was separated gradually from the main skin series by 1916. Prior to that date, only the large Seebohm collection (1901) and a few others, from 1912 onwards, appear in the *Egg Registers*. There are now 5 volumes, with a sixth currently in use, as well as 3 catalogue volumes of the Munt collection (1941), into which Museum registration numbers have been inserted. In about the mid 1890s, Henry Seebohm compiled a 10 volume manuscript catalogue of the eggs in the Museum collection, apart, it seems, from those in the public galleries. It was never published, but formed the basis for Oates (1901–12). An alphabetical accessions register (of donors and sellers) for the egg collection was started in the 1950s. Further information on the egg collection (and details of the card-index to the collection) will be found elsewhere in this paper.

The Skeleton Register

The register for skeletons was separated in 1952. At about the same time, the entries for old skeletons were extracted from the *Skeleton Vellum Catalogues* and the *General* and *Aves Registers* in a separate volume. A few numbers were overlooked, but not many.

The Nest, Spirit and Domestic Bird Registers

The register for nests was separated in 1959 and that for anatomical specimens in 1969. Numbers in all these separate series follow the format described for the *General* and *Bird Registers*.

Much of the nest collection is still unsorted and unregistered. Although new nests are given standard 3-part numbers, the old, previously unregistered nests are now allocated 2 groups of digits (collection and specimen), prefixed N (e.g. N257.3). Some nests previously given numbers in either the *General* or *Aves Registers* have been subsequently re-registered in this latter style.

Between 1900 and 1920, a separate register was maintained for domestic birds, but only a few pages were ever used.

ACCESS TO THE COLLECTIONS AND LIBRARY

Potential visitors to Tring should write to the Officer in Charge, stating the object of their proposed visit. Access is normally restricted to those undertaking original scientific research intended for publication. For such visits there is no charge. Work with commercial implications, including that of artists working on bird books, incurs bench charges or other fees. Visitors are encouraged to build bench fees into grant applications where possible. The collections are not normally accessible to casual visitors, although open days are held from time to time. Loans are made only to recognised institutions, on the same basis as visitor access.

INFORMATION RELATING TO THE COLLECTION

Several catalogues have been compiled, of which Gray (1844–67, 1847, 1863), Oates (1901–12), Sharpe & others (1874–98), Warren & Harrison (1966–73) and Knox & Walters (MS) are the most important. In addition, there have been numerous guides to the specimens in the public galleries (often giving data), and detailed catalogues of individual collections received by the Museum. Some of the latter were published as books, and others as papers in journals. References are given above to surveys of the spirit and skeleton collections.

Biographical and historical

Much historical information, together with biographical sketches of many of the collectors and donors, can be found in Sharpe (1906). Additional material relating to authors and collections appears in each of the 3 volumes of the catalogue of type-specimens (Warren & Harrison 1966–1973). Edwards (1870), Gunther (1975, 1980) and Stearn (1981) give general histories of the Museum and many of the staff, while Miriam Rothschild (1983) describes in detail the life and work of her uncle, Walter, and his famous museum at Tring where the Bird Section is now housed. Although not written with the museum user specifically in mind, Mearns & Mearns (1988) provide biographies of a great many relevant authors and collectors.

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Addresses: Dr A. G. Knox, Buckinghamshire County Museum, Tring Road, Halton, Bucks, HP22 5PJ; M. Walters, Natural History Museum, Tring, Herts, HP23 6AP.